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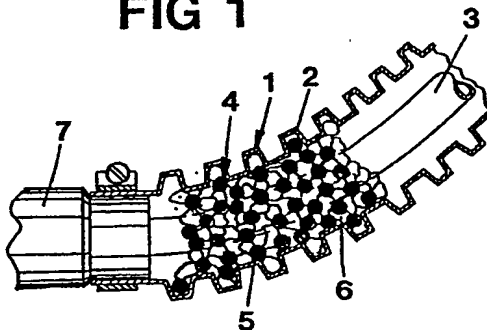
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(54) A device for absorption of carbon dioxide in a breathing apparatus.

(57) Device for absorption of carbon dioxide in a breathing apparatus and including a hose (1) for the breathing air. The hose (1) is at least partly filled with an absorption mass (4) including a carbon dioxide absorbing stuff (6) in granular form (5) which is mixed with a spacing substance (6) being of such character that it offers the breathing air a relatively low resistance. Alternatively the absorption mass (4) is in the shape of a porous framework with a plurality of granules (5) which are in point contact with each other.

## FIG 1



## A DEVICE FOR ABSORPTION OF CARBON DIOXIDE IN A BREATHING APPARATUS

The present invention refers to a device for absorption of carbon dioxide in a breathing apparatus including a hose for the breathing air.

### BACKGROUND OF THE INVENTION

- 5 In connection with breathing apparatuses it is previously known to use an absorption unit capable of absorbing carbon dioxide. An absorption unit of that character is described in Swedish Patent no. 362.201 and comprises a circular container having an inlet provided with a check valve the inlet being connected to a conduit for the exhalation air
- 10 and further having a diametrically opposed outlet which is connected to a conduit for the inhalation air over a check valve. In this case the container comprises a number of sector shaped compartments separated by porous walls and said compartments are filled with a substance capable of absorbing carbon dioxide. By a suitable arrangement of said
- 15 compartments a certain guiding of the air stream passing through the container is achieved such that also the absorbing mass which is not directly in line with the inlet and outlet of the container will be brought into contact with the air stream but a major part of the total absorbing surface of the absorption mass will not be active which means
- 20 that a comparatively big volume of absorption mass will be necessary for purification of a certain volume of air.

The structure comprising a separate container with check valves, a tight cover and hose connections is also complicated and expensive.

### THE MOST IMPORTANT CHARACTERISTICS OF THE INVENTION

- 25 The object of the invention has been to provide an absorption unit in which the absorbing material is utilized as effectively as possible and which may be produced at so low costs that it may be thrown away after one single use.

- In order to attain these and other objects the invention has the characteristics of the claims.
- 30

The accompanying drawing illustrates some embodiments of the invention.

Fig. 1 is a longitudinal section through a combined hose and absorption unit for a breathing apparatus.

- 5 Fig. 2 is a schematical longitudinal section through an absorbing mass which comprises a carbon dioxide absorbing granulate mixed with fragments of foamed plastic.

Fig. 3 is a similar section through an absorbing mass which consists of a foamed product with carbon dioxide absorbing granulate as a ballast.

- 10 Fig. 4 is a perspective view of an absorbing mass consisting of a granulate of a carbon dioxide absorbing stuff sintered to a framework and

Fig. 5 finally is a schematical longitudinal section through an absorbing mass comprising a plurality of frameworks according to fig. 4.

#### DESCRIPTION OF THE INVENTION

- 15 The combined hose and absorption unit shown in fig. 1 as a partial section includes an outer corrugated hose, i.e. a hose 1 which has a number of circumferential in section preferably trapezoid projections 2 this hose being preferably made from a plastic material such as polypropene, and an inner plain hose 3.

- 20 The space intermediate the inner and the outer hose contains an absorption mass 4 which in the embodiments of fig. 1 consists of a compound of granules 5 of CO<sub>2</sub> absorbing material such as sodium or potassium hydrate and small parts 6 of foamed plastic with open pores. The hose may be connected to the apparatus in question by means of adaptors 7 which in a

- 25 manner known per se may consist of elbow pipes, T-pipes or the like from which at least one may have a wall which the inner hose 3 sealingly penetrates. The intention is that fresh gas is to be carried through the inner hose and exhalation air or the like through the outer one and that an absorption of carbon dioxide will take place as long as the absorption  
30 ability of the absorbing mass exists. The period of time within which a specific amount of absorbing mass can give a substantially complete CO<sub>2</sub> absorption will then be a measure of the effectiveness of the absorption.

By mixing granulate of CO<sub>2</sub> absorbing material with pieces of foamed plastic having suitable dimension, shape and porosity it is possible to obtain such a guiding of the stream of air that an effective CO<sub>2</sub> absorption combined with a minor resistance against the passage of the air stream is achieved. Adjacent to the breathing nozzle the permeability of the air may be increased by increasing the percentage of foam plastic pieces and also by varying the filling degree and alternatively by arranging nets or grids between various absorption mass comprising hose sections thus making it possible to obtain the properties desirable in each specific case.

The absorption mass according to the invention may also be contained in a simple hose or in a housing provided with inlet and outlet, all depending upon the intended use. Since an absorption unit of the kind now described in the most simple case in addition to the indispensable hose only includes the absorption material itself and probably means for separating various sections thereof from each other the absorption unit will be so inexpensive that it may be thrown away after use. The amount of absorption mass will thus also be limited since it only has to be sufficient for one single patient.

In the embodiment shown in fig. 1 and 2 the absorption mass consists of a CO<sub>2</sub> absorbing granulate 5 mixed with fragments 6 of foamed plastic or material with similar properties but it is also possible to use such a granulate 5 as ballast in a foaming compound for obtaining a foam-like product 8 in which the absorbing granules 5 are contained.

In the embodiments according to figures 1-3 inclusive there exists as mentioned many possibilities to vary the permeability of the air respectively the control of the air stream such that it hits the biggest possible surface of the absorbing material.

An absorption effect although not so big but in certain cases sufficient may be obtained by sintering or baking according to fig. 4 the absorbing grains 5 into contiguous units where the separate grains only are in contact with each other in thin portions 9 and by arranging according to fig. 5 a plurality of such units behind each other and mutually displaced a porous body consisting of porous grains is obtained. It is also possible to bring forth such a sintering in such a manner that a three dimensional framework will be created where the active grains are randomly distributed

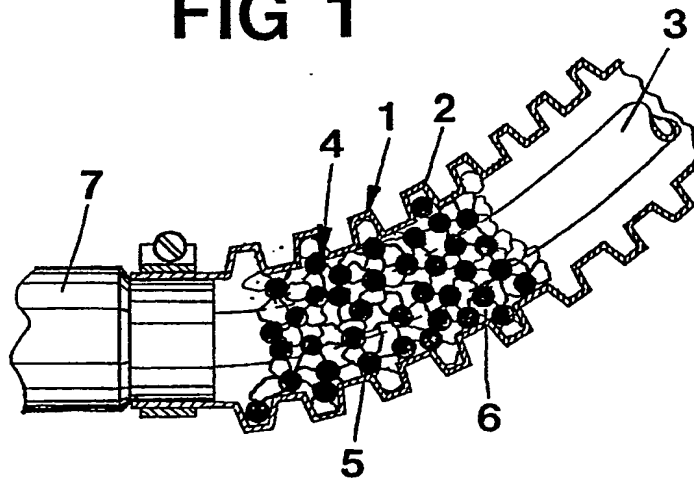
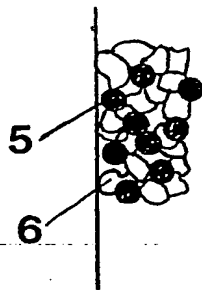
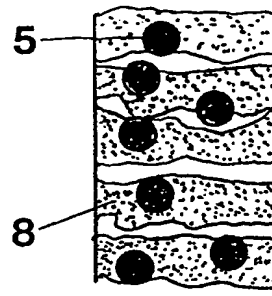
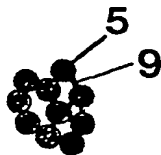
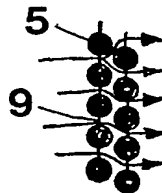
or distributed in a controlled manner.

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By arranging the absorption mass according to the invention there are provided labyrinth passages which the air stream has to pass such that it will come into contact also with grains that are located more distant.

- 5 Especially in the embodiment having a mixture of absorbing grains and pieces of foamed plastic the air stream will meet different resistance in the sections where the air stream passes a layer of foamed plastic respectively a space between two foamed plastic pieces, between a foamed plastic piece and a grain and so forth.

1. Device for absorption of carbon dioxide in a breathing apparatus including a hose (1) for the breathing air, c h a r a c t e r i z e d in that the hose (1) at least partly is filled with an absorbing mass (4)  
5 including a carbon dioxide absorbing material in granular form (5) which is mixed with a spacing substance (6) of a kind which offers a relatively low resistance to the breathing air.
2. Device according to claim 1, c h a r a c t e r i z e d in that said spacing substance consists of foam plastic pieces (6).
- 10 3. Device according to claim 1, c h a r a c t e r i z e d in that the absorption mass (4) consists of a foamed product (8) in which the granulate (5) is contained.
4. Device for absorption of carbon dioxide in a breathing apparatus including a hose (1) for the breathing air, c h a r a c t e r i z e d in  
15 that the hose (1) at least partly is filled with an absorbing mass (4) including a porous framework in the shape of a plurality of granules (5) being in pont contact with each other.
5. Device according to claim 4, c h a r a c t e r i z e d in that it includes a unit comprising a plurality of behind each other located plates  
20 each comprising granules (5) sintered together and being so displaced relative to each other that the channels passing therethrough will be of a labyrinth character.
6. Device according to any of the preceding claims, c h a r a c t e r i z e d in that the absorption mass (4) is contained in the space between an outer  
25 breathing hose (1) and a hose (3) for fresh gas supply provided inside said outer hose.

**FIG 1****FIG 2****FIG 3****FIG 4****FIG 5**



DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 4)
A	GB-A-1 371 150 (AGA AB) * Whole document * & SE-A-362 201 (Cat. D)	1-6	A 62 D 9/00 A 62 B 19/00
A	DE-C- 635 674 (CHEMISCHE FABRIK Dr. HUGO STOLZENBERG) * Whole document *	1-3	
A	DE-C- 648 911 (A. HLOCH) * Whole document *	1,4,5	
A	DE-C- 747 383 (AUERGESELLSCHAFT AG) * Whole document *	1,4-6	
A	GB-A- 396 864 (E. THALER et al.) * Whole document *	1-3	TECHNICAL FIELDS SEARCHED (Int. Cl. 4)
A	US-A-4 383 956 (G.T. CROFT et al.) * Whole document *	1-6	A 62 D A 62 B
A	GB-A-2 013 102 (H. VON BLUECHER et al.) * Claims *	1-6	
A	US-A-1 654 925 (A.B. DRAEGER) * Whole document *	1-3,6	
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 03-06-1987	Examiner FLETCHER A.S.
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	